

CHARTS
FLOW PLANS

PAINT NUMBERED
TREES

PERMANENT
SAMPLES

TIMBER
BOOKKEEPING

UNIT
RECORDS

THE DIAMETER
TAPE

TRIAL
BALANCE

PORT-A-
PUNCH

FOREST CONTROL

A
1323
In 81
KB

by CONTINUOUS INVENTORY

"Today I have grown taller from walking
with the trees."

...Karle Wilson

Upper Darby, Pa. February 1967 No. 148

Have YOU heard about the
FOREST SERVICE INTERNATIONAL 1/4 inch kerf LOG RULE?

Progress is sometimes so slow that it is difficult to see any motion. This has been true in the evolution of a good standard log rule for estimating the amount of lumber that a mill will probably cut out of a log. A little movement is becoming evident now.

The three rules most frequently used throughout the U.S.A. (there are others used in certain locations) have for years been the Doyle, the Scribner Decimal C and the International 1/4 inch kerf.

The advantage of the Doyle is that it is easy to remember as a simple formula:

$$\text{Volume in board feet} = \left(\frac{D - 4}{4} \right)^2 \times L$$

where D is the diameter at the small end in inches and L is the length of the log in feet.

The Scribner Decimal C is based on a diagram of the one-inch boards, saw kerf and slabs that would be cut out of a cylinder having a diameter equal to that at the small end of the log. The enchantment of this rule has been its decimalization which made it an easy rule to memorize.

The International 1/8 inch kerf Rule, developed in 1900 by Judson F. Clark - a Canadian - is a formula rule. It is made by mathematically reducing the board foot volume of a cylinder for slab thickness, for saw kerf between one-inch boards, and for board shrinkage. For a four-foot cylindrical section, the

$$\text{Volume in board feet} = 0.22 D^2 - 0.71 D$$

W. W. Barton, Forester



with D the small end diameter in inches. The volume of a 16-foot log (standard length in Eastern forests in old times) is determined by adding volumes of four of these four-foot sections with diameters increasing $1/2$ inch per section from the top of the log down. Thus, this rule allows for a taper of $1/2$ inch for each four feet of log length.

When the average log was 20 to 30 inches or more in diameter, both the Doyle and the Scribner Decimal C gave a close approximation of the volume that would cut out. The International was close, too; but with its $1/8$ inch saw kerf allowance, its volumes were slightly high. This problem was remedied by developing a factor (0.905) to convert the rule from $1/8$ inch kerf to $1/4$ inch kerf.

With this adjustment, the International Rule follows the cut out volume closely from small to large diameter logs. Doyle and Scribner Rules greatly under estimate volumes of small diameter logs. Today there are many small diameter logs. For these reasons, many States have adopted the International $1/4$ inch kerf Rule as their legal rule for use in litigation when contestants have not agreed on a rule.

In 1955, with sanction of H. H. Chapman - friend of Clark and promoter of his rule in U.S.A. - the U.S.F.S. Eastern Region (then R-7) decimalized the International $1/4$ inch kerf Log Rule and put it to work on all timber sales on its National Forests. The expanded Eastern Region (now R-9) has changed from Scribner Decimal C to this rule on its National Forests in Illinois, Indiana, Missouri, and Ohio. In the West some National Forest timber sales are now being made on the basis of this rule. The decimalized rule is approved for use nationwide on the National Forests and is incorporated in the U.S.F.S. National Forest Log Scaling Handbook.

After many years of evolution it looks as though there may be developing a trend towards adoption of a single good log rule for general use. As it becomes better known through exposure in journals, in use on National Forests and State Forests and on influential private forest operations and by consulting foresters, its use will probably accelerate. A copy of the Forest Service International $1/4$ inch kerf Rule is attached. This rule is in the pocket edition of the National Forest Log Scaling Handbook which may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, at \$1.75 per copy.

TABLE VI.
FOREST SERVICE INTERNATIONAL 1/4-INCH DECIMAL RULE
Board Foot Volumes in 10's

Diam.	Log Lengths in Feet															16	17	18	19	20
	4	5	6	7	8	9	10	11	12	13	14	15								
4"	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
5"	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
6"	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3
7"	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5
8"	1	1	1	1	2	2	2	2	2	3	3	3	4	4	4	5	5	6	6	7
9"	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	6	6	6	6	7
10"	1	2	2	2	3	3	4	4	4	5	5	6	6	6	6	7	7	8	8	9
11"	2	2	3	3	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11
12"	2	3	3	4	4	5	6	6	7	8	8	9	9	10	10	11	11	12	12	13
13"	3	3	4	5	5	6	7	8	8	9	10	11	11	12	12	13	13	14	14	15
14"	3	4	5	5	6	7	8	9	10	11	12	13	13	14	15	16	16	17	17	18
15"	4	4	5	6	7	8	9	10	11	12	14	15	15	16	17	18	18	19	19	20
16"	4	5	6	7	8	10	11	12	13	14	16	17	17	18	19	21	21	22	22	23
17"	5	6	7	8	10	11	12	14	15	16	18	19	19	21	22	24	24	25	25	26
18"	5	7	8	10	11	12	14	15	17	18	20	22	22	23	25	27	27	28	28	30
19"	6	8	9	11	12	14	16	17	19	21	22	24	24	26	28	30	32	32	33	34
20"	7	8	10	12	14	16	17	19	21	23	25	27	27	29	31	33	35	35	36	37
21"	7	9	11	13	15	17	19	21	23	26	28	30	30	32	34	37	39	39	41	41
22"	8	10	13	15	17	19	21	24	26	28	31	33	33	35	38	40	43	43	45	45
23"	9	11	14	16	19	21	24	26	28	31	34	36	36	39	42	44	47	47	50	50
24"	10	13	15	18	20	23	26	28	31	34	37	40	40	42	45	48	51	51	54	54
25"	11	14	16	19	22	25	28	31	34	37	40	43	43	46	49	53	56	56	59	59
26"	12	15	18	21	24	27	30	34	37	40	43	47	47	50	54	57	60	60	64	64
27"	13	16	19	23	26	30	33	36	40	43	47	51	51	54	58	62	65	65	69	69
28"	14	17	21	25	28	32	36	39	43	47	51	55	55	58	62	66	70	70	74	74
29"	15	19	23	26	30	34	38	42	46	50	55	59	59	63	67	71	76	76	80	80
30"	16	20	24	28	33	37	41	45	50	54	59	63	63	67	72	77	81	81	86	86
31"	17	22	26	30	35	39	44	49	53	58	63	67	67	72	77	82	87	87	92	92
32"	18	23	28	33	37	42	47	52	57	62	67	72	72	77	82	87	93	93	98	98
33"	20	25	30	35	40	45	50	55	61	66	71	77	77	82	88	93	99	99	104	104
34"	21	26	32	37	42	48	53	59	64	70	76	82	82	87	93	99	105	105	111	111
35"	22	28	34	39	45	51	57	63	68	74	81	87	87	93	99	105	111	111	118	118
36"	23	30	36	42	48	54	60	66	73	79	85	92	92	98	105	111	118	118	124	124
37"	25	31	38	44	50	57	64	70	77	84	90	97	97	104	111	118	125	125	132	132
38"	26	33	40	47	53	60	67	74	81	88	95	103	103	110	117	124	132	132	139	139
39"	28	35	42	49	56	64	71	78	86	93	101	108	108	116	123	131	139	139	146	146
40"	29	37	44	52	59	67	75	82	90	98	106	114	114	122	130	138	146	146	154	154

TABLE VI. 2-Forest Service International 1/4-Inch Decimal Rule,
Board Foot volumes in 10's.

Diam.	Log Lengths in ft.																			
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
41"	31	39	47	55	62	71	79	87	95	103	111	120	128	137	145	154	162			
42"	32	41	49	57	66	74	83	91	100	108	117	126	135	144	152	161	170			
43"	34	43	51	60	69	78	87	96	105	114	123	132	141	151	160	169	179			
44"	36	45	54	63	72	82	91	100	110	119	129	138	148	158	168	177	187			
45"	37	47	57	66	76	86	95	105	115	125	135	145	155	165	175	186	196			
46"	39	49	59	69	79	89	100	110	120	131	141	152	162	173	183	194	205			
47"	41	51	62	72	83	94	104	115	126	137	147	158	169	181	192	203	214			
48"	43	54	65	76	87	98	109	120	131	143	154	165	177	188	200	212	223			
49"	45	56	67	79	90	102	114	125	137	149	161	172	184	196	209	221	233			
50"	47	58	70	82	94	106	118	130	143	155	167	180	192	205	217	230	243			
51"	49	61	73	86	98	111	123	136	149	161	174	187	200	213	226	239	253			
52"	50	63	76	89	102	115	128	141	155	168	181	195	208	222	235	249	263			
53"	53	66	79	93	106	120	133	147	161	175	188	202	216	230	245	258	273			
54"	55	68	82	96	110	124	139	153	167	181	196	210	225	239	254	269	284			
55"	57	71	86	100	114	129	144	159	173	188	203	218	233	248	264	279	294			
56"	59	74	89	104	119	134	149	165	180	195	211	226	242	258	274	289	305			
57"	61	77	92	108	123	139	155	171	186	203	219	235	251	267	284	300	316			
58"	63	79	95	112	128	144	160	177	193	210	226	243	260	277	294	311	328			
59"	66	82	99	116	132	149	166	183	200	217	234	252	269	287	304	322	339			
60"	68	85	102	120	137	154	172	189	207	225	243	260	278	296	315	333	351			
61"	70	88	106	124	142	160	178	196	214	233	251	269	288	307	325	344	363			
62"	73	91	109	128	146	165	184	203	221	240	259	278	297	317	336	356	375			
63"	75	94	113	132	151	171	190	209	229	248	268	288	307	327	347	367	387			
64"	77	97	117	136	156	176	196	216	236	256	277	297	317	338	359	379	400			
65"	80	100	121	141	161	182	202	223	244	265	286	306	327	349	370	391	412			
66"	82	103	124	145	166	188	209	230	251	273	295	316	337	360	382	403	425			
67"	85	107	128	150	171	193	215	237	259	281	304	326	348	371	393	416	439			
68"	88	110	132	154	177	199	222	244	267	290	313	336	359	382	405	429	452			
69"	90	113	136	159	182	205	229	252	275	299	322	346	370	394	417	441	465			
70"	93	117	140	164	187	211	235	259	283	308	332	356	380	405	430	454	479			
71"	96	120	144	169	193	218	242	267	292	317	342	367	392	417	442	468	493			
72"	99	124	149	174	199	224	249	275	300	326	351	377	403	429	455	481	507			
73"	101	127	153	179	204	230	256	282	309	335	361	388	414	441	468	495	521			
74"	104	131	157	184	210	237	264	290	317	344	371	399	426	453	481	508	536			
75"	107	134	161	189	216	243	271	298	326	354	382	410	438	466	494	522	551			
76"	110	138	166	194	222	250	278	307	335	363	392	421	449	478	507	537	566			
77"	113	142	170	199	228	257	286	315	344	373	403	432	461	491	521	551	581			
78"	116	146	175	204	234	264	293	323	353	383	413	443	474	504	535	565	596			
79"	119	149	180	210	240	270	301	332	362	393	424	455	486	517	549	580	611			
80"	122	153	184	215	246	277	309	340	372	403	435	467	499	531	563	595	627			

TABLE VI. 3-Forest Service International 1/4-Inch Decimal Rule,
Board Foot volumes in 10's.

Diam.	Log Lengths in ft.																			
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
81"	125	157	189	221	252	285	317	349	381	414	446	479	511	544	577	610	643			
82"	129	161	194	226	259	292	325	358	391	424	457	491	524	558	592	625	659			
83"	132	165	199	232	265	299	333	367	400	435	469	503	537	572	606	641	675			
84"	135	169	203	233	272	306	341	376	410	445	480	515	550	586	621	657	692			
85"	138	177	208	243	278	314	349	385	420	456	492	528	564	600	636	672	709			
86"	142	178	213	249	285	321	358	394	430	467	504	540	577	614	651	688	726			
87"	145	182	219	255	292	329	366	403	440	478	516	553	591	629	667	705	743			
88"	149	186	224	261	299	337	375	413	451	489	528	566	605	643	682	721	760			
89"	152	190	229	267	306	345	383	422	461	501	540	579	618	658	698	735	777			
90"	155	195	234	273	313	352	392	432	472	512	552	592	633	673	714	755	795			
91"	159	199	239	280	320	360	401	442	482	524	565	606	647	688	730	772	813			
92"	163	204	245	286	327	369	410	452	493	535	577	619	661	704	746	789	831			
93"	166	208	250	292	334	377	419	462	504	547	590	633	676	719	763	806	849			
94"	170	213	256	299	342	385	428	472	515	559	603	647	691	735	779	824	868			
95"	174	217	261	305	349	393	438	482	526	571	616	661	706	751	796	841	887			
96"	177	221	267	312	357	402	447	492	538	583	629	675	721	767	813	859	906			
97"	181	227	273	318	364	410	457	503	549	596	642	689	736	783	830	877	925			
98"	185	232	278	325	372	419	466	513	561	608	656	704	751	799	848	896	944			
99"	189	236	284	332	379	428	476	524	572	621	669	718	767	816	865	914	963			
100"	193	241	290	339	387	436	486	535	584	634	683	733	783	833	883	933	983			
101"	197	246	296	346	395	445	496	546	596	646	697	748	798	850	901	952	1003			
102"	201	251	302	353	403	454	505	557	608	659	711	763	814	867	919	971	1023			
103"	205	256	308	360	411	463	516	568	620	673	725	778	831	884	937	990	1043			
104"	209	261	314	367	419	473	526	579	632	686	740	793	847	901	955	1010	1064			
105"	213	266	320	374	428	482	536	590	644	699	754	809	863	919	974	1029	1085			
106"	217	272	326	381	436	491	546	602	657	713	769	824	880	936	993	1049	1105			
107"	221	277	333	388	444	501	557	613	670	726	783	840	897	954	1012	1069	1127			
108"	225	282	339	396	453	510	567	625	682	740	798	856	914	972	1031	1089	1148			
109"	230	287	345	403	461	520	578	637	695	754	813	872	931	991	1050	1110	1169			
110"	234	293	352	411	470	529	589	648	708	768	828	888	948	1009	1070	1130	1191			
111"	238	298	358	418	479	539	600	660	721	782	843	905	966	1028	1089	1151	1213			
112"	243	304	365	426	487	549	611	673	734	797	859	921	983	1046	1109	1172	1235			
113"	247	309	372	434	496	559	622	685	748	811	874	938	1001	1065	1129	1193	1257			
114"	251	315	378	442	505	569	633	697	761	826	890	955	1019	1084	1149	1215	1280			
115"	256	320	385	450	514	579	644	709	775	840	906	972	1037	1104	1170	1236	1302			
116"	260	326	392	458	523	589	656	722	788	855	922	989	1056	1123	1190	1258	1325			
117"	265	332	399	466	532	600	667	735	802	870	938	1006	1074	1143	1211	1280	1348			
118"	270	338	406	474	542	610	679	747	816	885	954	1024	1093	1162	1232	1302	1372			
119"	274	343	413	482	551	621	690	760	830	900	971	1041	1111	1182	1253	1324	1395			
120"	279	349	420	490	560	631	702	773	844	916	987	1059	1130	1202	1274	1347	1419			

Footnote: International 1/8" rule volumes computed electronically to four decimals, rounded to nearest tenth board foot. This volume multiplied by .905 for 1/4" rule volumes, rounded to one decimal, rounded to nearest 10 board feet. Volumes that could be influenced by the rounding to a tenth in the 1/8" calculations were recalculated, using all decimals. Decimal volumes thus are the same as if all decimals had been used in the calculations.

This tabulation represents volume calculated from the basic equation for the volume of a 4-foot section, i.e., volume = .22 (D²) - .71 (D).

Volume for sections 8, 12, 16 and 20 feet were obtained by allowing 1/2 inch taper for each 4 feet of length and totaling the volumes for the sections. For other log lengths between 4 and 20 feet, linear interpolation was used.